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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte JUN HAMAKITA and YOSHIKAZU KAWADA

Appeal 2009-010562
Application 10/796,301
Technology Center 3600

Before JENNIFER D. BAHR, STEVEN D.A. McCARTHY and
KEN B. BARRETT, *Administrative Patent Judges*.

McCARTHY, *Administrative Patent Judge.*

DECISION ON APPEAL

STATEMENT OF THE CASE

The Appellants appeal under 35 U.S.C. § 134 from the Examiner's final decision rejecting claims 1-5, 10-12, 14 and 16. The Examiner rejects claims 1-5, 10, 12, 14 and 16 under 35 U.S.C. § 103(a) as being unpatentable over Eda (US 5,482,127, issued Jan. 9, 1996) and Lewis (US 3,234,758, issued Feb. 15, 1966); and claim 11 under § 103(a) as being unpatentable over Eda, Lewis and Kobayashi (US 6,900,564 B2, issued May

31, 2005). We have jurisdiction under 35 U.S.C. § 6(b).

We sustain the rejections of claims 1-5, 10, 12, 14 and 16. Pursuant to 37 C.F.R. § 41.50(d), we designate our decision to sustain these rejections as NEW GROUNDS OF REJECTION. We do not sustain the rejection of claim 11.

Claim 1 is illustrative of the claims on appeal:

> 1. An electric power steering device for transmitting rotation of motor for assisting operation of steering which is reduced via a reduction gear to a steering mechanism, the electric power steering device comprising:
>
> a spline shaft and a cylindrical body that is connected to a rotary shaft of said motor, said spline shaft and said cylindrical body being joined to each other for transmitting the rotation of the motor to the reduction gear; and
>
> a grease including a base oil having a kinetic viscosity of 1000 to 5000 mm^2/s (40°C), a worked penetration of said grease being not more than 300, and which is charged in a gap between said spline shaft and said cylindrical body,
>
> wherein the electric power steering device is devoid of an O-ring between said spline shaft and said cylindrical body.

ISSUES

The Appellants argue specific claim language distinctive of each of claims 1-5, 10-12, 14 and 16. (*See* App. Br. 9-15). Nevertheless, the Appellants' arguments may be addressed fairly by addressing only two issues. Only issues and findings of fact contested by the Appellants will be addressed. See *Ex Parte Frye*, 94 USPQ2d 1072, 1075-76 (BPAI 2010).

First, do the evidence and technical reasoning underlying the rejection of claims 1-5, 10, 12, 14 and 16 adequately support the conclusion that an electric power steering device including a grease having a work penetration not more than 300, and more specifically not more than 260 and not less than 200, the grease including a base oil having a kinematic viscosity[1] of 1000 to 5000 mm^2/s (40°C), and more specifically of not less than 1500 mm^2/s and not more than 2500 mm^2/s, would have been obvious? (*See* App. Br. 9-15; Reply Br. 2-3).

Second, do the evidence and technical reasoning underlying the rejection of claims 1-5, 10, 12, 14 and 16 adequately support the conclusion that an electric power steering device including a speed reduction mechanism comprising a shaft and a wheel including a synthetic resin member comprising at least one of polyacetal terephthalate and polybutylene terephthalate would have been obvious? (App. Br. 15).

FINDINGS OF FACT

The record supports the following findings of fact ("FF") by a preponderance of the evidence.

1. We adopt and incorporate by reference the Examiner's uncontested findings starting at page 3, line 20 ("Eda et al. discloses . . .")

[1] The term "kinetic viscosity" appearing in independent claims 1 and 12 as well as in the Specification appears to refer to kinematic viscosity.

and ending at page 5, line 7 (". . . to prevent wear and friction in jointed assemblies with slip splines.")

2. The Appellants admit in the Specification that,

> in order to more positively prevent the generation of gear noise, it is preferable that the kinetic viscosity of base oil is not less than 1500 mm^2/s (40°C) in the above range. In order to further enhance the working property of the assembling, it is preferable that the kinetic viscosity of base oil is not more than 2500 mm^2/s (40°C) in the above range.

(Spec. 13, ll. 21-27).

3. In the context of the Specification, to "further enhance the working property of the assembling" implies reducing the difficulty of inserting and engaging the spline shaft in the cylindrical body. (*Compare* Spec. 13, ll. 21-24 *with* Spec. 2, l. 27 – 3, l. 8).

4. The Appellants admit in the Specification that, as of the filing date, it was common

> to charge grease of low viscosity into the engagement portion of both joint members of the joint, for example, kinetic viscosity of base oil of the grease is 100 to 300 mm^2/s (40°C), and worked penetration of the grease stipulated by Japanese Industrial Standard JIS K2220 1993 is 200 to 280.

(Spec. 1, ll. 21-27).

5. Lewis teaches that:

> In lubricating such heavily loaded contacting surfaces, it is essential to employ a lubricant which will not be displaced from the interfacial contacting area. Lubricants of a relatively low viscosity, such as conventional low viscosity oils,

> are unsatisfactory for this type of application since they do not have sufficient "body" to resist being squeezed from the contacting interface under heavy compression. Higher viscosity lubricants, such as heavy oils and greases, have customarily been employed to lubricate highly loaded contacting surfaces. Under moderate load conditions a heavy oil is generally satisfactory if the contacting surfaces can be immersed in a bath of the lubricant. However, under severe load conditions conventional lubricants do not have sufficient viscosity or consistency to resist being squeezed from the contacting interface when most needed.

(Lewis, col. 1, ll. 21-36).

6. As of the filing date of the underlying application, the National Lubricating Grease Institute ("NLGI") "classified greases according to their consistency as measured by the worked penetration." (ASTM Int'l, Summary of Historical Standard ASTM D217-02 (2002)(superseded), http://www.astm.org/DATABASE.CART/HISTORICAL/D217-02.htm (last visited July 13, 2011).) The measures used to classify greases according to NLGI consistency grades were consistent with those measured according to Standard JIS K 2220. (*See* Stock Drive Products/Sterling Instrument, ELEMENTS OF METRIC GEAR TECHNOLOGY T-229 (date unknown), http://www.sdp-si.com/D785/HTML1/D785T225_5.html (last visited July 13, 2011)).[2]

[2] Copies of these two references are enclosed. The latter reference does not appear to be prior art to the underlying application. We rely on the reference solely to explain what is inherently disclosed by Lewis, which is prior art.

7. Lewis teaches charging the gap between a spline shaft and a cylindrical body with a lubricant including a No. 3 NLGI grade lubricating grease. (FF 1; Lewis, col. 3, ll. 8-11 and 29-30).

8. A No. 3 NLGI grade lubricating grease has a worked penetration of 220-250. (ASTM Int'l, Summary of Historical Standard ASTM D217-02 (2002)(superseded), http://www.astm.org/DATABASE.CART/HISTORICAL/D217-02.htm (last visited July 13, 2011).)

ANALYSIS

First Issue

The Examiner correctly found that the electric power steering device described by Eda differs from the devices recited in the appealed claims in that Eda

> *fails to disclose or suggest* a motivation for: charging grease in a gap between the male splined portion of the first transmission shaft and the female splined portion on the cylindrical body; the grease including a base oil having a kinetic viscosity of 1000 to 5000 mm^2/s (40°C), and a worked penetration of the grease being not more than 300; *or* the kinetic viscosity of the base oil being not more than 2500 mm^2/s; *or* the kinetic viscosity of the base oil being not less than 1500 mm^2/s; *or* the worked penetration of the grease being not more than 260; the worked penetration of the grease being not less than 200 *or* the worked penetration of the grease being between 200 and 260.

(Ans. 4). Lewis teaches charging grease in a gap between a male splined portion of a first transmission shaft and a female splined portion on a cylindrical body. (FF 1). Lewis additionally teaches that the grease charge

in the gap preferably has a worked penetration of 200 to 250, not more than 300 and within the range not less than 200 and not more than 260. (FF 6-8). Even were it found that Lewis does not teach using grease having a worked penetration in this range, the Appellants admit that it was conventional to use grease having a worked penetration in the range of 200 to 260, albeit having a kinematic viscosity in a range lower than the ranges recited in claims 1-5 and 10-12. (FF 4).

In view of these teachings, it would have been obvious to charge grease into the gap between the male spline *130b* of the first transmission shaft *130* and the female spline *131c* of the cylindrical body *131b* of Eda's electric power steering device. (*Cf.* FF 1 (referring to findings of the Examiner identifying the first transmission shaft and the cylindrical body)). It would have been obvious to do so in order to relieve friction and to prevent wear when a load was applied to the splined parts. Furthermore, it would have been obvious to charge the gap between the two splines with grease having a worked penetration not more than 300 and within the range not less than 200 and not more than 260, since this range appears to have been conventional. This range satisfies the limitation on the worked penetration of the grease charged in the gap in each of the claims on appeal having such a limitation.

Neither Eda nor Lewis teaches charging the gap between the male spline *130b* of the first transmission shaft *130* and the female spline *131c* of the cylindrical body *131b* of Eda's electric power steering device with grease having a kinematic viscosity in the range of 1000 to 5000 mm^2/s (40°C) as recited in claim 1, 4, 5 and 10-12; in the range of not less than 1500 mm^2/s to 5000 mm^2/s as recited in claim 2; and in the range of 1000

mm^2/s to not more than 2500 mm^2/s as recited in claim 3. Nevertheless, the Examiner correctly concluded that it would have been obvious to charge the gap between the male spline *130b* of the first transmission shaft *130* and the female spline *131c* of the cylindrical body *131b* of Eda's electric power steering device with grease having a kinematic viscosity in the range of not less than 1500 mm^2/s and not more than 2500 mm^2/s, thereby satisfying each limitation on the kinematic viscosity of the charged grease recited in any of the claims on appeal.

More specifically, the Examiner is correct in concluding that one of ordinary skill could have found this range by means of routine experimentation within the level of ordinary skill in the art. *See*, *e.g.*, *In re Boesch*, 617 F.2d 272, 276 (CCPA 1980). The Appellants respond that kinematic viscosity was not a result-effective variable which one of ordinary skill in the art would have had reason to attempt to optimize. (Reply Br. 3).

Lewis teaches that it is undesirable to use "conventional low viscosity oils" to lubricate heavily loaded contacting surface in automotive applications. (FF 5). More specifically, Lewis teaches that lubricants "of a relatively low viscosity, such as conventional low viscosity oils, are unsatisfactory . . . since they do not have sufficient 'body' to resist being squeezed from the contacting interface under heavy compression." (*Id.*) These statements would have provided one of ordinary skill in the art reason to try charging the gap between two meshing splined parts such as the first transmission shaft *130* and the cylindrical body *131b* of Eda's electric power steering device with a grease having a viscosity higher than the 100 mm^2/s to 300 mm^2/s which the Appellants describe as having been conventional as of the filing date of the underlying application. (*See* FF 4). Despite Lewis'

teaching that even heavy oil is unsatisfactory for some severe load conditions (FF 5), one of ordinary skill in the art would have had a reasonable expectation that a grease with a viscosity higher than conventional low viscosity oils would have improved the lubrication of splined joints in automotive applications.

The Appellants indicate in the Specification that charging such a gap with a grease formulated from a base oil having a kinematic viscosity less than 1500 mm^2/s (40°C) would not have adequately addressed the generation of gear noise. (FF 3). The Appellants also indicate in the Specification that charging such a gap with a grease formulated from a base oil having a kinematic viscosity more than 2500 mm^2/s (40°C) would have resulted in an undesirable level of difficulty in inserting and engaging the spline of the transmission shaft in the cylindrical body. (*Id.*) As the Examiner points out (*see* Ans. 9), these problems would have led one of ordinary skill in the art experimenting with greases of different kinematic viscosities to the range of not less than 1500 mm^2/s and not more than 2500 mm^2/s.

Therefore, the combinations claimed in claims 1-5, 10, 12, 14 and 16 would have been obvious from the teachings of Eda and Lewis. We sustain the rejection of claims 1-5, 10, 12, 14 and 16 under § 103(a) as being unpatentable over Eda and Lewis. Nevertheless, we recognize that, in sustaining these claims, we have relied on references and findings which the Examiner did not have. For example, the Examiner expressly found that Lewis did not specifically disclose or mention specific greases having worked penetrations within the claimed values (Ans. 5). We find to the contrary. (FF 6-8). In order to provide the Appellants a full and fair

opportunity to respond to the grounds of rejection as sustained here, we designate our decision to sustain the rejection of claims 1-5, 10, 12, 14 and 16 as new grounds of rejection.

Second Issue

The Examiner finds, and we agree, that "Kobayashi et al. discloses an electric power steering system, very similar in nature to that of Eda et al., with a worm wheel (19), having teeth formed of a polyacetal resin (POM)." (Ans. 6; *see also* Kobayashi, col. 3, ll. 15-17). Nevertheless, the Examiner's reasoning that it would have been obvious "to manufacture the worm wheel (or part of the worm wheel) in Eda et al.'s invention, and in combination with the teachings of Lewis, out of a polyacetal resin (POM) for optimal performance depending on the operating conditions of the particular application in which the worm wheel is utilized" (*id.*) is conclusory. (*See* App. Br. 15 (arguing that the "alleged combination of Eda, Lewis, and Kobayashi does not teach or suggest this feature of the claimed invention.").) The Examiner provides no information concerning the performance variable to be optimized by the choice of polyacetal terephthalate or concerning the properties of polyacetal terephthalate that might serve to optimize that variable. Neither does the Examiner provide any background information which might suggest that the size of the genus of polyacetal resins was such that the choice of the specific species recited in claim 11 would have been obvious. We do not sustain the rejection of claim 11 under § 103(a) as being unpatentable over Eda, Lewis and Kobayashi.

DECISION

We REVERSE the Examiner's decision rejecting claim 11.

We AFFIRM the Examiner's decision rejecting claims 1-5, 10, 12, 14 and 16.

Under 37 C.F.R. § 41.50(b), we have designated our affirmance of the decision rejecting claims 1-5, 10, 12, 14 and 16 as new grounds of rejection of those claims under § 103(a) as being unpatentable over Eda and Lewis. 37 C.F.R. § 41.50(b) provides that, "[a] new ground of rejection pursuant to this paragraph shall not be considered final for judicial review."

Regarding the new ground of rejection, the Appellants must, WITHIN TWO MONTHS FROM THE DATE OF THE DECISION, exercise one of the following options with respect to the new ground of rejection, in order to avoid termination of the appeal as to the rejected claims:

(1) *Reopen prosecution.* Submit an appropriate amendment of the claims so rejected or new evidence relating to the claims so rejected, or both, and have the matter reconsidered by the examiner, in which event the proceeding will be remanded to the examiner. . . [; or]

(2) *Request rehearing.* Request that the proceeding be reheard under § 41.52 by the Board upon the same record.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a) (2007).

AFFIRMED-IN-PART; 37 C.F.R. § 41.50(b)

JRG